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DECLARATION FOR A PATENT APPLICATION

▼ INSTRUCTIONS
(a) Insert "Convention" if applicable
(b) Insert FULL name(s) of applicant(s)

In support of the (a) application made by
(b) Sekisui Kagaku Kogyo Kabushiki Kaisha

(c) Insert "of addition" if applicable
(d) Insert TITLE of invention

(hereinafter called "applicant(s) for a patent (c) for an invention entitled (d)

Interlayer for Laminated Glass

(e) Insert FULL name(s) AND address(es) of declarant(s) (See headnote*)

I/~~We~~ (e) Tamio Tsuji, managing director, of Sekisui Kagaku Kogyo Kabushiki Kaisha of 4-4, Nishitenma 2-chome, Kita-ku, Osaka, Japan,

do solemnly and sincerely declare as follows:

~~1. I am/We are the applicant(s).~~
~~(or, in the case of an application by a body corporate)~~

1. I am/~~We are~~ authorized to make this declaration on behalf of the applicant~~(s)~~.

~~2. I am/We are the actual inventor(s) of the invention.~~
~~(or, where the applicant(s) is/are not the actual inventor(s))~~

(f) Insert FULL name(s) AND address(es) of actual inventor(s)

2. (f) Gen Endo of 25-24, Oka-machi, Moriyama-shi, Shiga-ken, Japan; Hiroyuki Tateishi of 15-49 Anyouji-machi, Ohmihachiman-shi, Shiga-ken, Japan; Yoshihiro Kawata of 868-16, Murai, Hino-machi, Gamou-gun, Shiga-ken, Japan; Isao Karasudani of 30-5, Seta, 3-chome Ohtsu-shi, Shiga-ken, Japan; and Hirofumi Omura of *(see over)

(g) Recite how applicant(s) derive(s) title from actual inventor(s) (See headnote**)

~~I~~/are the actual inventor(s) of the invention and the facts upon which the applicant~~(s)~~ is/~~are~~ entitled to make the application are as follows:

(g) Applicant is the Assignee of the inventors with regard to the invention.

(Note: *Paragraphs 3 and 4 apply only to Convention applications)*

(h) Insert country, e.g. date, and basic applicant(s) for the/or EACH basic application

~~3. The basic application(s) for patent or similar protection on which the application is based~~ is/are identified by country, filing date, and basic applicant(s) as follows:

(h)

~~4. The basic application(s) referred to in paragraph 3 hereof was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.~~

(k) Insert PLACE of signing

Declared at (k) Osaka, Japan

(l) Insert DATE of signing

Dated (l) May 12, 1988

(m) Signature(s) of declarant(s)

(m) Tamio Tsuji

Tamio Tsuji, managing director

Note: No legalization or other witness required

To: The Commissioner of Patents

in charge of Patent

P18/7/78

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PHILLIPS ORMONDE & FITZPATRICK
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Melbourne, Australia

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576895

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COMPLETE SPECIFICATION

(ORIGINAL)

Class Int. Class

Application Number: 47868/85.

Lodged:

Complete Specification Lodged:

Accepted:

Published:

Priority

Related Art:

APPLICANT'S REF.: G4114-K109(Sekisui)/SN

Name(s) of Applicant(s): SEKISUI KAGAKU KOGYO KABUSHIKI KAISHA

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Actual Inventor(s): Gen ENDO, Hiroyuki TATEISHI, Yoshihiro KAWATA, Isao KARASUDANI & Hirofumi OMURA.

Address for Service is:

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Complete Specification for the invention entitled:

INTERLAYER FOR LAMINATED GLASS

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

raised portions 4 and depressed portions 5 (inclusively designated by 2) are formed on both surfaces of an interlayer 1, and numerous fine raised and depressed portions 3 are formed on the surfaces of the coarse raised and depressed portions 2, and the surfaces of the interlayer 1 have double raised and depressed areas.

Preferably, a depressed portion 5 of the coarse raised and depressed portion 2 is directly connected to the depressed portion 5 of the adjacent raised and depressed portion 2, as shown in the drawing. If desired, the depressed portions 5,5 of the adjacent raised and depressed portions 2,2 may be connected through a flat portion. In the latter case, the area of the flat portion is preferably minimized in order to increase the antiblocking property of the interlayer.

In the illustrated embodiment, the coarse raised and depressed portions are arranged irregularly on the surface of the interlayers, but if desired, they may be arranged regularly. If further desired, the coarse raised portions may be connected in a long line in one direction to form ridges, and a narrow channel may be formed between adjacent ridges. In this case, however, it is necessary to remove air during laminated glass production in a direction nearly corresponding to such a narrow channel.

Referring to Figure 2 showing a surface roughness curve of the interlayer 1 at a certain position measured by using the needle contacting method.

The average distance of adjacent coarse raised or depressed portions is measured, for example, as an average of distance between the bottoms of the adjacent coarse depressed portions. Let us consider the surface roughness curve of Figure 2 with respect to a part having a standard length L. Let the distance between the bottoms of two adjacent depressed portions be $\overline{W}i$ (where i is an integer of 1 to n, and n+1 is the number of the bottoms of depressed portions existing in the standard length L), then

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roughness H, the interlayer blocks, or its adhesion to the glass is too strong, and the operability of laminate glass production is reduced.

The 10-point average roughness of the fine raised and depressed portions is measured after the coarse raised and depressed portions (also called undulations) are removd from the surface (sectional) curve shown in Figure 2. Removal of the coarse raised and depressed portions from the sectional curve is carried out generally by using a filter circult used in an electrical surface roughness tester, or by utilizing the locus of the center of a circle having a large radius of curvature obtained when the sectional curve is traced with the circle. The method using a filter circuit is preferred. Most of needle-contacting type surface roughness testers now in use are adapted to electrically amplifying the movement of a contact needle, and the aforeaaid filter circuit is usually built within the testers. One example of the surface roughness test containing a filter circuit built therein is Surfcom 1210A (a contact needle type surface roughness tester made by Toyo Seimitsui Kabushiki Kaisha).

In the present invention, it is preferred to employ 0.08 mm as the length of cutoff in the filter circuit in accordance with Japanese Industrial Standard, JIS B-601-1976.

Examples of the thermoplastic resin used to form the interlayer in accordance with this invention include polyvinyl butyral, polyurethane, ethylene/vinyl acetate copolymer, ethylene/vinyl acetate/vinyl alcohol copolymer, and ethylene/methyl methacrylate copolymer. For use in automobile laminated glass, the use of plasticized polyvinyl butyral is preferred.

The interlayer of this invention may have various known additives, such as ultraviolet absorbers, antioxidants, coloring agents and adhesiveness adjusting agents, contained therein or adhering thereto. For various end

A laminated glass containing the interlayer of this invention may be produced usually by holding the interlayer between an inorganic glass sheet and an inorganic glass sheet or between an inorganic glass sheet and an organic glass sheet composed of a transparent rigid resin such as a polycarbonate resin or an acrylic resin, and removing air from the inside of the assembly by placing it in a rubber bag or by using nip rolls and squeezing it between the rolls to preliminarily press-bond the constituents of the assembly, and thereafter consolidating it at high temperatures and pressures in an autoclave. As a result, a transparent laminated glass can be obtained.

The preferred embodiments and advantages of this invention are illustrated by the following Examples and Comparative Examples.

In the following examples, the antiblocking property of the interlayer film or sheet and the foaming of the laminated glass by heating were measured by the following methods.

(1) Antiblocking property

The interlayer was cut into pieces having a size of 100 mm x 25 mm. Two pieces were laminated and a load of 2 kg was placed on the laminate. It was left to stand at room temperature for 24 hours. Then, the laminate was subjected to a 180 degree peel test at a pulling speed of 200 mm/min. The average (three replicates) of the peeling forces was calculated, and defined as a measure of antiblocking property.

The larger the value, the higher the adhesion strength between the film pieces, and therefore the worse the operability of laminated glass production.

(2) Foaming

The interlayer was held between two inorganic glass sheets, and the resulting assembly was passed through a heating oven. The surface temperature of the heated laminate was adjusted, and air was removed from inside the

COMPARATIVE EXAMPLE 1

In the same way as in Example 1, an interlayer film having a raised and depressed pattern without fine raised and depressed portions as shown in Table 1 was produced by using an embossing roll. The antiblocking property of this interlayer film and the foaming of a laminated glass are shown in Table 1.

COMPARATIVE EXAMPLE 2

A commercial plasticized polyvinyl butyral interlayer film having steel raised portions and deep depressed portions on both surfaces was examined for the shapes of the raised and depressed portions and properties. The foaming of a laminated glass produced by using this interlayer was also examined. The results are shown in Table 1.

In the interlayer of this invention, the average distance between adjacent coarse raised or depressed portions is about 2 to about 10 times the average roughness of the coarse raised and depressed portions and no deep valley nor steep ridge exists. Accordingly, air does not remain in a step of holding the interlayer with glass sheets and performing deaeration, and consequently, a laminated glass free from foams can be obtained.

Since fine raised and depressed portions are further formed on the surfaces of the coarse raised and depressed portions in the interlayer of this invention, the interlayer has good antiblocking property and does not excessively adhere to glass sheets, the operability of the laminated glass production is improved and the number of laminated glasses which can be stored in the stacked state increases.

Since the interlayer of this invention has the foresaid double raised and depressed pattern on its surface, the raised portions are easily collapsed at the time of preliminary press-bonding step, the line speed of the preliminarily press-bonding step can be increased.

The claims defining the invention are as follows:

1. An interlayer for a laminated glass, said interlayer being composed of a film or sheet of a thermoplastic resin, at least one surface of the film or sheet of the thermoplastic resin having numerous coarse raised and depressed portions and numerous fine raised and depressed portions existing on the surfaces of the coarse raised and depressed portions, the average distance between two adjacent coarse depressed or raised portions being 2 to 10 times the 10-point average roughness of the coarse raised and depressed portions measured in accordance with ISO-R468.

2. The interlayer of claim 1 wherein the average distance is 100 to 500 micrometers, and the 10-point average roughness is 20 to 100 micrometers.

3. The interlayer of claim 2 wherein the average distance is 200 to 300 micrometers, and the 10-point average roughness is 25 to 70 micrometers.

4. The interlayer of any one of claims 1 to 3, wherein the 10-point average roughness of the fine raised and depressed portions is 5 to 20 micrometers.

5. The interlayer of any one of claims 1 to 4, wherein the thermoplastic resin is plasticized polyvinyl butyral.

6. An interlayer according to claim 1 substantially as herein described with reference to the accompanying drawings.

7. An interlayer according to claim 1 substantially as herein described with reference to any one of Examples 1 to 3.

DATED : 12 July, 1988.

PHILLIPS ORMONDE & FITZPATRICK
ATTORNEYS FOR:
SEKISUI KAGAKU KOGYO KABUSHIKI KAISHA

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FIG. 1

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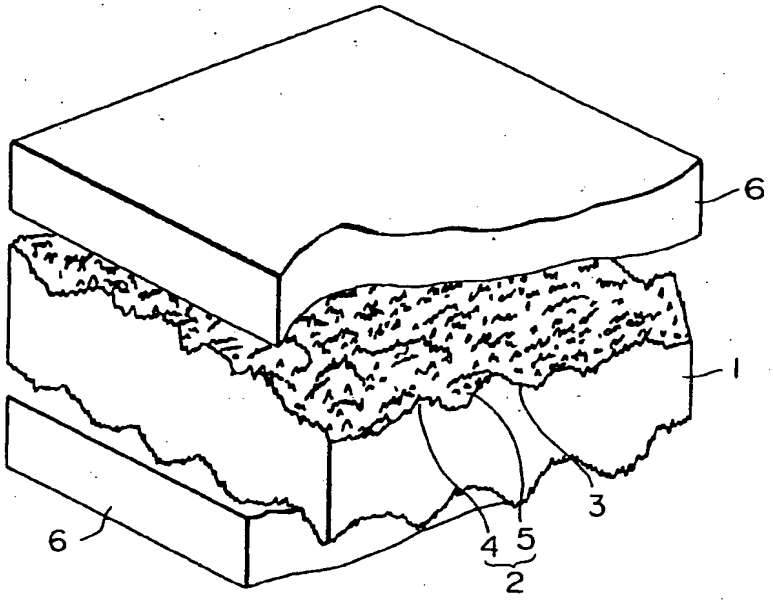
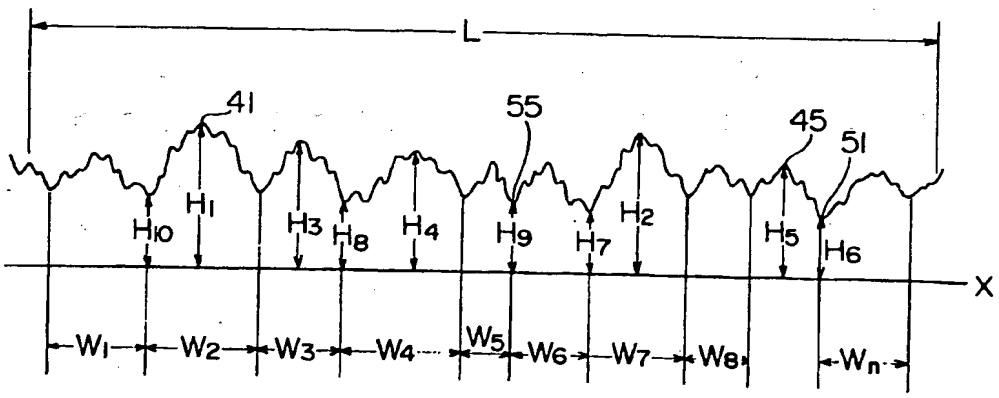


FIG. 2



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